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### Sustainable Design: economic and environmental life cycle assessment model

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# SUSTAINABLE DESIGN ECONOMIC AND ENVIRONMENTAL LIFE CYCLE ASSESSMENT MODEL



Francesca THIÉBAT | Architect PhD | Politecnico di Torino | Turin | Italy  
francesca.thiebat@polito.it | francesca@patdesign.it

The research goal is the definition of an **economic-environmental efficiency factor** for building design. It will be a useful tool both for designers –to guide choices- and clients –as first control device.

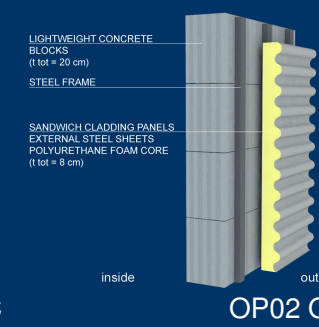
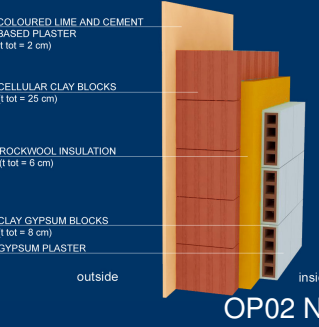
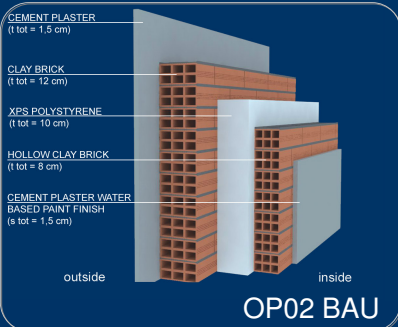
The factor, named **€CO**, integrates the economic aspect into an environmental evaluation model. It is based on life cycle at the scale of the technical component (building envelope).

## Materials & Methods

$$€CO = (X_{LCC} * \eta_{LCC}) + (X_{GWP} * \eta_{GWP}) + (X_{CED} * \eta_{CED})$$

- X<sub>LCC</sub> = Economic Performance
- X<sub>GWP</sub> = Environmental Performance (Global Warming Potential)
- X<sub>CED</sub> = Environmental Performance (Cumulative Energy Demand)
- η<sub>LCC</sub> = Weight of LCC
- η<sub>GWP</sub> = Weight of GWP
- η<sub>CED</sub> = Weight of CED

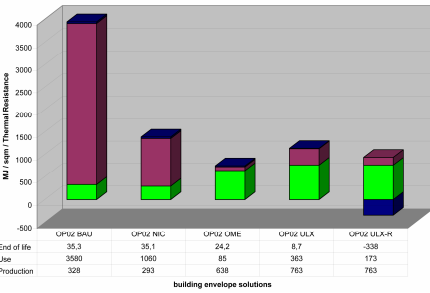
Defining the €CO factor is a step toward the integration of Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) in evaluating building projects.



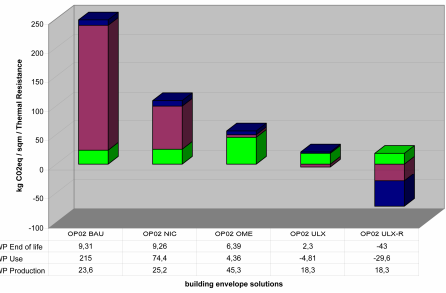
## Results

### ENVIRONMENTAL IMPACTS "from cradle to grave"

IMPACT ASSESSMENT CED (Cumulative energy demand)

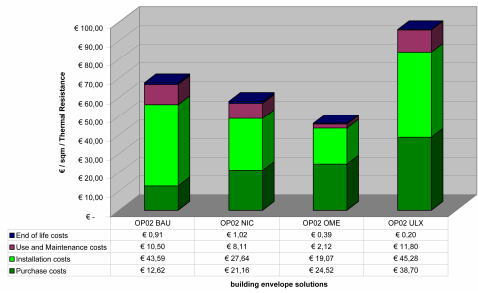


IMPACT ASSESSMENT GWP100 (greenhouse effect)



### ECONOMIC IMPACTS "from cradle to grave"

IMPACT ASSESSMENT LCC (Life Cycle Costs)



## Discussions & Conclusions

In order to verify and validate the outcome, different methods -derived from published international researches- have been applied to evaluate the same building envelopes.

Comparing the results obtained through €CO with other methods, it is possible to affirm that the scale of values is substantially unaltered (examples: see pictures below).

